Chaparral ENERGY

March 8, 2011

Mr. Philip B. Dellinger
Chief Ground Water/UIC Section
US Environmental Protection Agency (6WQ-S)
1445 Ross Avenue
Dallas, Texas 75202

Re: Chaparral Energy, L.L.C.
North Burbank Unit Operations
Historical Narrative

Dear Mr. Dellinger:

During the meetings we have had over the last two years concerning the possible injection of CO_2 into the North Burbank Field and eventually the South Burbank Field we have had much discussion concerning the planned operations and the operational history of this area and how the previous Operator addressed the need to seal the Burbank Formation for use as a waterflood.

First of all I would like to state that when people hear CO_2 injection their minds immediately think of a gas injection system. However, when Oil and Gas operators use CO_2 it is in its compressed state, therefore the use of CO_2 as an enhanced recovery fluid is the same as injecting the fluid most familiar to regulatory agencies which is water. CO_2 under compression is in a liquid state with properties similar to water, just that its chemical composition is CO_2 not H_2O. 3 not quite

That said Chaparral would like to memorialize many of the items we have discussed as to the history of the waterflood. The previous operator was no fly-by-night organization. Phillips Petroleum put this Unit together during the late 1940's and was finally granted a Unit designation in 1950 and 1951 by the Osage Indian Tribe and the Bureau of Indian Affairs. They operated this Unit until late 1995 when Calumet Oil Company (later merged into Chaparral Energy, L.L.C.) purchased the Unit and has revitalized the waterflood since then. Calumet/Chaparral has taken production from about 160 BOPD to in excess of 1600 BOPD currently.

Phillips put this Unit together with the thought in mind that they would operate the flood at what was considered a "Low to Medium" injection pressure. Phillips started operating NBU as a waterflood with an average injection pressure of 30 psig at the surface (1483 psi reservoir pressure). However, to maintain the injection rates, injections pressures slowly rose throughout the field. Phillips did some injection tests in various areas of the NBU flood and found that an injection pressure of 500+ psig (or 1953 psi reservoir) seemed to give them the injection rates they sought to achieve. During early stages of water injection Phillips operated with highest recorded shut-in reservoir pressure being 1865 and average injection pressures at the reservoir

sand-face of 1880 psi. Also when the Unit began to have Polymer Studies and Tests done the pressures utilized in those areas were 1760 psi reservoir pressure. Currently Chaparral is operating with a maximum sand-face pressure of 2097 psi (max allowed under EPA rules now). This is to say that each Unit Operator has injected into the reservoir at operating pressures at or above what Chaparral is asking for in injection pressures for possible CO_2 flooding. We are not asking for a new pressure limit to be established! Chaparral Energy, L.L.C. is just asking the EPA to maintain the already present pressures, which were obtained and justified by presentation to earlier governing bodies.

Phillips and Chaparral have also been very aware that the Burbank formation had to be contained for this secondary waterflood and now our tertiary proposed work to be a success. That is what makes the NBU and SBU areas so viable for advanced recovery techniques. When the waterflood was first started in the NBU area Phillips started the flood based on an inverted five (5) star pattern. Soon afterward they experienced premature breakthrough of water in an East-West trending manner. In the mid 1950's a study was undertaken to assess why this was occurring. As an outcome of this study Phillips realized there was a strong permeability trend along an ENE trend which seemed to follow natural fractures within the Sand Bar. Thus Phillips undertook to plug many of the old injection and production wells and make the flood essentially a line drive flood.

In a review of early Engineering Subcommittee minutes there is an indication that Phillips realized at that time (mid 1950's) the need to contain injected fluids within the Burbank formation. This resulted in many of the older "mud plugged" wells being cleaned out and re-plugged using the highly cementatious mud/cement combination that was used on many of the injectors which were also abandoned during that time frame and into the early 1960's. This plugging effort was done right along with the drilling of many new injectors and producers to implement the line drive pattern. During the plugging operations that occurred from 1955 to 1965 many of the wells were reported to be filled with "Mud" or "Heavy Mud". However, this "Mud" was a very special mud not just ordinary drilling mud.

Because Phillips was drilling and cementing so many new wells there was a lot of excess cement which surfaced on the surface casing cement jobs, or was mixed and not pumped on the long string jobs. (Remember this was before we had precise mix tanks on trucks.) This cement contaminated mud was moved to a special "Pit" that Phillips maintained near their Shidler office. This mud/cement mix was then mixed with the pit clean-outs from the drilling locations to form a cementaious mud system. This "Pit" was maintained by Phillips by literally stirring the "mud" with a bulldozer. This was the "Mud" or "Heavy Mud" used and reported in the plugging operations.

Years later the EPA asked Chaparral to obtain a sample of this "Mud". We could not drill into it without using a rock bit because the properties were of a set up cement plug rather than a dried mud plug. When Chaparral personnel tried to obtain a sample of this material we drove a piece of tubing into it by dropping an open ended piece of tubing into a 60 foot deep hole and then dropping the draw-works on top of the tubing to drive the tubing into the "Mud". We finally recovered about 2 feet this way. EPA's field inspector in Osage County, (Mr. Kent Sanborn)

witnessed the recovered product of this operation and knows that it is more of a cement with mud for a volume booster, than a mud plug which is friable and malleable. No testing was done on this sample as it was not considered needed at the time. However, between these plugging operations and the pressure referenced earlier the significance is that no wells have shown signs of salt water contamination to the surface waters from the pressure in the Burbank Formation.

Also when Chaparral took over the field we were required by the BIA to plug and abandon over 100 wells within the NBU. All these wells and any subsequent wells that we have plugged have been plugged with every step possible taken to insure that the wells have been plugged with excess cement at the formation if possible, or as near the Burbank as could be obtained within the wellbore. When wells had junk in the hole that could not be removed all wells have been plugged using a cement retainer to assure that cement was pumped below that barrier and all wells were usually on a vacuum so that we know that the fluids sank to the Burbank Formation.

Any wells that have been "re-plugged" over the years, and there are only a handful out of 1400+ wellbores in this area, have been holes where surface rain water has entered the well bore near the surface and run out of the old wellbore. Or where wells that only had bottom plugs placed in them for possible re-use have had shallow surface water eat the surface casing and enter the well bore enough to fill it, thus causing the well to "run-over". Again no salt water has migrated from the Burbank formation pressuring project to the surface.

The USDW levels set within the NBU area are based on log response from an old well in the far Northeastern part of the field. However, as the population of Osage County grows, there have been numerous new water wells drilled near and within the aerial extent of the NBU and it cousin floods the Stanley Stringer Middle Burbank Unit Operated by Linn Energy, and the South Burbank Unit operated by Chaparral also. These water wells are typically about 100 to 200 feet deep and have not reported any saltwater contamination from flooding operations.

Taken as a whole all these pieces show that the Burbank Formation is sealed adequately. Phillips Petroleum's mud plugged holes, before the EPA existed, are really cement plugged wells top to bottom. That Phillips and Chaparral have striven to insure that the Burbank Formation is thoroughly sealed from other formations and the pressures requested by Chaparral for our CO_2 operations are within the operating parameters that have been established within this Unit for some 60 years.

There is at a minimum potentially 60 MMBO or more to be recovered under tertiary recovery techniques and this is a major economic boost for Chaparral Energy, L.L.C. and the Osage Mineral Estate. We hope this letter will help convince the EPA and your department that continued flooding of the Burbank by secondary and tertiary techniques is safe, secure, and in the best interest of all involved.

As we have previously discussed. Chaparral is willing to drill monitor wells and establish air monitors for CO_2 in the area of the active flood to assure to the EPA that no contamination is occurring. If any of these wells should indicate that there is any danger, Chaparral will do everything possible to stop this situation from growing. We realize that this is a sensitive area

since it is on the Osage Indian homelands; however we feel that with proper diligence all parties will be happy with our efforts. There are many CO2 injection floods throughout the United States; the fact that the EPA has never permitted one should not be an insurmountable barrier for the EPA to overcome.

To that end, Chaparral Energy, L.L.C. operates several WAG (Water and Gas injection) units in Texas and Oklahoma. Also we are beginning a new CO_2 (WAG) project in Texas within the next 6 months; we also will be starting a new CO_2 (WAG) project in Kansas within the near future. Our Company has many years of experience in the operation of these types of floods and we have been successful in all the current floods of not losing CO_2 or saltwater into fresh water bearing formations. Our expertise should give the EPA some confidence that Chaparral is not going to be learning about these operations at the expense of the EPA and Osage Nation.

One last item, when we first appeared before you and your staff, their attitude was that Chaparral did not care if the CO_2 leaked from the Burbank Formation. This is far from the truth as day is from night. Chaparral will be spending money to obtain this anthropogenic CO_2 and then will be spending money to transport the product to the field. We view the CO_2 as a commodity which has great value to Chaparral; we do not want to waste any of it! So all operations will be monitored and conducted as we do in all our existing CO_2 floods throughout Oklahoma and Texas. The permitting of a CO_2 flood may be new to the EPA, but the techniques and operating practices are old school for many oil and gas operators, such as Chaparral.

If you have any questions, or need more data contact us at the address listed.

Sincerely,
Chaparral Energy, L.L.C.

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